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Understanding Regional Export Growth in China

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In this paper, we use disaggregated data on regional trade in China to assess the channels through which the country's exports have surged. As a starting point for our analysis, we use a Bartik (1991) shift-share approach to evaluate the common component of industry-level export growth across regions in China. If regional comparative advantage or industry agglomeration patterns are roughly stable over decadal time periods, then export growth across regions will vary according to their initial patterns of industrial specialization and which industries enjoyed rapid export growth at the national level. We also consider the impact of explicit measures of policy change that the literature has identified as drivers of China's trade expansion, including reductions of tariffs on final goods, tariffs on imported intermediate inputs, trade-policy uncertainty for China in the U.S. market, and MFA quotas on apparel and textile products. We find that a simple Bartik measure has substantial predictive power for China's regional export growth. Once we add the Bartik measure to the analysis, the impacts of reduced input and output tariffs or trade-policy uncertainty on China's export growth fall substantially and become statistically insignificant. These tariff-based predictors of export growth are also very sensitive to the inclusion of time trends across provinces and broad sectors, whereas the Bartik measure has considerably more success in predicting variation in export growth within provinces and sectors. There is little evidence that regions more exposed to the elimination of MFA quotas enjoyed faster export growth.

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1 Introduction

Over the last quarter century, China has emerged as the world's most dynamic manufacturing nation. Based on data from the World Development Indicators, between 1991 and 2013 the country's share of global manufacturing value added grew more than six fold, rising from 4% to 24%. Having surpassed the United States in 2010, China is now the world's largest producer of manufactured goods. As China's manufacturing sector has grown, so too has its presence in global markets. Between 1991 and 2014, China's share of world manufacturing exports increased more than seven times, from 2% to 17%, with most of this growth having occurred by 2010, when the global financial crisis dented growth in world trade. Today, China is the world's factory.

Most discussions of China's manufacturing boom center on economic reforms that the country enacted in the 1980s and 1990s, which initiated a process of export-led development similar to that of the Asian Tigers — Hong Kong, Singapore, South Korea, and Taiwan — in earlier decades (Rodrik, 2006; Hsieh and Ossa, 2016). Initial reforms created special economic zones in which foreign enterprises set up export processing plants to import parts and components for the assembly of final exports (Wang, 2013; Alder, Shao, and Zilibotti, 2016). By the late 1990s, export-processing plants accounted for over half of China's manufacturing exports (Yu and Tian, 2012 and 2017), with most of this production occurring in establishments owned by multinational corporations. A second phase of reforms closed and consolidated state-owned enterprises, allowing higher productivity private manufacturers to expand (Hsieh and Song, 2015). At the same time, the de facto relaxation of barriers on internal migration permitted over 150 million workers to reallocate from rural farms to urban factories (Li, Li, Wu and Xiong, 2012; Fan, 2015; Zi, 2016).

China's outward-oriented economic-policy changes culminated with its accession to the World Trade Organization in 2001, which reduced tariff barriers on imported intermediate inputs (Yu, 2015; Amiti, Dai, Feenstra, and Romalis, 2017; Brandt, Van Biesebroeck, Wang, and Zhang, 2017; Yu and Tian, 2017), phased out restrictions on which firms are allowed to export directly (Ding, Sung, and Jiang, 2015; Bai, Krishna, and Ma, 2017), and attenuated uncertainty over China's access to foreign markets, the United States in particular (Pierce and Schott, 2016; Handley and Limao, 2017; Erten and Leight, 2017). Together, these modifications helped China's manufacturing sector achieve annual rates of productivity growth of nearly eight percent, on a value-added basis, and of nearly three percent, on a gross-output basis, in the ten years preceding the onset of the global financial crisis (Brandt, Van Biesebroeck and Zhang, 2012).

In this paper, we use disaggregated regional data on Chinese trade to assess the channels through which the country's exports have surged. We begin the analysis by describing how the composition of exports in China changed during the period spanning the country's accession to the WTO. Since 2000, the share of export processing in China's exports has declined, as China has shifted into more vertically integrated forms of production for global markets. Due in large part to the liberalization of foreign trading rights, the share of exports by state-owned enterprises has plummeted. In their place, the share of exports by foreign-owned enterprises has grown steadily, while the share by private domestic enterprises has skyrocketed. Also over this time period, China's exports shifted from traditionally labor-intensive goods, such as apparel, footwear, furniture, and toys, to more sophisticated electronics products, including cellphone handsets and laptop computers (Xu and Lu, 2009). Two decades ago, China had few brands that were recognized globally. Today, Huawei (telecommunications equipment) and Lenovo (personal computers) are the largest global producers in their respective industries, while three of the top five producers of smartphones are Chinese companies (Huawei, Oppo, and Vivo).

As a starting point for our analysis, we use a Bartik (1991) approach to evaluate the common component of industry-level export growth across regions in China. Applied in our context, this approach, which takes the method in Autor, Dorn, and Hanson (2013) for modeling the growth in U.S. imports from China down to the level of Chinese regions, involves predicting a region's manufacturing export growth over the 2000s by combining the initial regional share of economic activity in each industry with national export growth in that industry and then summing across industries. Regions are "exposed" to better export-growth opportunities if they begin specialized in industries that subsequently experience rapid growth at the national level.

We thus imagine that a region's pattern of industrial specialization as of the late 1990s is predictive of its later export growth. Predictability may arise from stability in regional comparative advantage over time (or at least over the 10-year period that we examine) or from the geographic clustering of related industries, such that growth in one industry (textiles) tends to be related to growth in upstream industries (chemicals) or downstream industries (apparel). Our reduced-form empirical approach allows us to be agnostic about the origins of regional export growth. Variation in regional export growth may reflect regional stability in relative factor supplies (which would determine comparative advantage in a Heckscher-Ohlin setting), in relative industry technological capabilities (which would determine comparative advantage in a Ricardian setting), or in localization patterns arising from agglomeration economies. Our use of a Bartik measure to explain China's export growth is similar in spirit to Bombardini and Li (2016), who examine the consequences of China's export boom for pollution-related mortality in the country, and Cheng and Potlogea (2015), who study how trade-related economic linkages affect local economic development in China.

Of course, regional comparative advantage or industry agglomeration are not the only factors that indicate a region's export-growth potential. The substantial changes in China's economic policy over the time period that we study are also potentially important determinants of regional export growth, at least to the extent that regions differ in their exposure to these policy changes. Our analysis also considers the impact on exports of explicit measures of policy change that the literature has identified as important drivers of China's trade expansion, in particular, and post-trade liberalization episodes, in general. These include the reduction of barriers on imported intermediate inputs, the Pierce and Schott (2016) measure of policy uncertainty confronting China in the U.S. market (Feng, Li, and Swenson, 2017), and reductions in quotas on apparel and textile products mandated by the end of the Multi-Fiber Arrangement (Khandelwal, Schott, and Wei, 2013). To avoid the confounding effects of the surge in state lending that China undertook to combat the global financial crisis (Bai, Hsieh, and Song, 2016), we focus our analysis on the years 2000 to 2010, which captures a period of accelerated export and productivity growth in China (Brandt, Wang, and Zhang, 2017) and coincides with the most intense phase of China's export boom.

We find that a simple Bartik measure has substantial predictive power for China's regional export growth. Even though China's regional development has been highly uneven, the spatial pattern of regional export growth is to a large extent explained by industry trends at the national level. Our results indicate that a region at the 75th percentile of exposure to China's national export boom would have had growth in export intensity 0.1 standard deviations higher than a region at the 25th percentile of exposure. Once we add the Bartik measure to the regression, the estimated impact of reduced input tariffs on China's export growth falls substantially and loses statistical significance. A similar outcome is observed for the Pierce and Schott and Handley and Limao uncertainty measures, whose impacts on export growth falls to zero with the inclusion of the Bartik measure. The ability of these tariff-based measures to predict export growth also declines considerably when province dummies or controls for the initial specialization of cities in the textile/apparel and electronics/machinery sectors are added to the regression analysis. Whereas exposure to different tariff regimes appears to vary to a large extent across rather than within provinces and sectors, the Bartik measure provides a consistently strong prediction of export growth even when province-level and sector-level trends are absorbed into control variables. We see little evidence that regions more exposed to the elimination of MFA quotas enjoyed faster export growth.

Next, we examine the importance of export regimes (processing versus ordinary exports) and firm ownership type (state-owned, foreign-owned, domestic privately owned establishments) in China's export growth. If some regions — say, because of their proximity to ports — are better suited to export processing, they may have enjoyed relatively rapid growth (Brandt and Morrow, 2017; Dai, Maitra, and Yu, 2016). Similarly, regions that were initially more dominated by state-owned enterprises may have seen slower growth as foreign and private domestic firms outpaced SOEs in their ability to attract resources and penetrate foreign markets (Hsieh and Song, 2015). We find that ordinary exports and processing exports operate as independent drivers of regional export growth, while among firm types it is national growth in industry exports by foreign-owned enterprises — rather than by state-owned or private domestic enterprises — that is the strongest predictor of regional expansion in exports. The initial attractiveness of regions to foreign-owned companies, driven in part perhaps by Deng Xiaoping's early experiments in opening locations to foreign investment and trade — appears to have laid the foundation for China's 2000s export boom.

The result of our analysis is a reduced-form model of regional export growth in China, which can be used to support analysis of the local-labor-market impacts of deeper global economic integration. The rapidly growing literature on how import competition from lower-income countries has affected labor markets in developed economics (e.g., Autor, Dorn, and Hanson, 2013 and 2016; Autor, Dorn, Hanson, and Song, 2014; Acemoglu, Autor, Dorn, Hanson, and Price. 2016) has not been matched by an equivalent volume of work on how China's export growth has affected its own local labor markets. A newly emerging literature examines how export growth in China affects local pollution (Bombardini and Li, 2016), enhances incentives for skill and capital accumulation (Cheng and Potlogea, 2015; Li, 2015), and induces reallocation of labor out of agriculture and into manufacturing (Fan, 2015; Zi, 2015; Leight, 2016; Erten and Leight, 2017). Our results provide a foundation for the analysis of how China's export boom affected China's regional economies.

2 Background on China's Export Growth

China's quarter century of export growth began in the early 1990s. Although Deng Xiaoping initiated economic reform in the late 1970s, the early emphasis was on improving incentives for agricultural production and relaxing centralized control over industry. In 1989, after more than a decade of reform, China still remained a small player in global manufacturing, accounting for only 1.8% of global manufacturing exports. When hardliners re-established control over economic policy following the events at Tiananmen Square in 1989, reform stalled and there was doubt about the sustainability of China's transition toward a market economy (Naughton, 2007). It was not until the reformist camp reaffirmed its authority over economic policy in the early 1990s that China fully embraced export-led development. Deng's famous "southern tour" in 1992 focused national attention on the successes of earlier policy experiments in a handful of locations on China's east coast (Vogel, 2011). These efforts had included the creation of special economic zones (SEZs), which allowed foreign companies to set up export processing plants that imported inputs and exported final outputs, relatively free from government interference (Yu and Tian, 2017; Alder, Shao and Zilibotti, 2016). As the number of SEZs grew from 20 in 1991 to 150 in 2010, foreign-owned export plants proliferated. According to the World Development Indicators, inflows of foreign direct investment, which averaged only 0.7% of GDP during the 1980s, rose to 4.2% of GDP during the 1990s and 2000s.

China's economic isolation under Mao created abundant opportunities for later catch up (Zhu, 2012; Brandt, Ma, and Rawski, 2016). Because the distortions of the Maoist era kept China far inside its production frontier, market opening ignited a phase of transitional growth that was governed in large part by the country's accumulated productivity gap with the developed world (Song, Storesletten, and Zilibotti, 2011). A key feature of this transitional growth was China realizing its long dormant comparative advantage in manufacturing. Whereas many large emerging economies specialize in primary commodities—including Brazil in iron ore, Indonesia in rubber, Russia in oil and gas, and South Africa in minerals—China's advantage is overwhelmingly in industrial goods. Over the period 1990 to 2013, manufacturing averaged 88% of China's total exports of goods and services. This fraction of manufacturing exports was higher than any other country with consistent data over this time period, and simply stunning for such a large economy. Relative to other major emerging economies, China's manufacturing export share over this time period compares to 77% in South Korea, 69% in Mexico, 60% in Thailand, 59% in the Philippines, 49% in India, 48% in Vietnam, 42% in Indonesia, 41% in Brazil, 40% in South Africa, and 18% in Russia. To the extent that China's regions varied either in their comparative advantage within manufacturing (e.g., coal supplies in China's northeast may account for the region's strength in steel production) or their access to foreign markets (e.g., the proximity of Guangdong province to Hong Kong may have helped its local firms make connections with multinational enterprises), the country's transitional growth may have favored particular industries in particular locations. It is the combination of China's dramatic market opening and its latent relative strength in manufacturing production that we exploit in specifying a Bartik-style, reduced-form model for export growth in China.

The culmination of China's entry onto the world economic stage was its accession to the WTO in 2001. The country's entry occurred over the course of nearly a decade. In 1996, China began to meet preconditions for its WTO accession by removing its most restrictive non-tariff barriers. Trade licenses, special import arrangements, and discriminatory policies against foreign goods were reduced or eliminated, thereby making import tariffs the primary instruments of protection. In 2001, China began to reduce tariffs themselves. The simple average tariff (across six-digit HS products) fell from 17% in 2000 (with a standard deviation of 12%) to 6% by the end of 2005 (with a standard deviation that was nearly fifty percent smaller). Since 2005, average tariffs have remained stable (Amiti, Dai, Feenstra, and Romalis, 2017).

Changes in tariffs have meant increased competition from imports in China's domestic market and improved access to imported intermediate inputs. A now substantial literature documents the positive impact of lower barriers on imported inputs on the productivity of manufacturing plants, including work by Amiti and Konings (2007) on Indonesia; Topalova and Khandelwal (2011) and Goldberg, Khandelwal, Pavcnik, and Topalova (2010) on India; and Yu (2015) and Brandt, Van Biesebroeck, Wang, and Zhang (2017) on China itself. Thus, one indirect way in which the WTO accession may have enhanced China's export performance was by raising productivity through lower-cost access to foreign inputs and capital goods and the advanced technology that they embody.

The WTO accession also inspired other reforms. One was privatization (Berkowitz, Ma, and Nishioka, 2017). In the late 1990s and early 2000s, China idled many state-owned manufacturing enterprises, helping the country move towards compliance with WTO provisions that restrict state subsidies to domestic industries. Capital and labor were consequently reallocated from smaller, less productive state-owned companies to privately owned manufacturing plants, helping raise productivity and output in the sector (Hsieh and Song, 2015). Joining the WTO also obligated China to phase out requirements that had mandated most private establishments to export through state-run intermediaries. Such restrictions constitute barriers to exporting, which the WTO expressly forbids. Bai, Krishna, and Ma (2017) estimate that had private firms not been granted direct foreign trading rights, China's manufacturing exports in the 2000s would have been one third smaller than they were. A further consequence of China's WTO entry regards the insecurity of its access to the U.S. market on a most-favored nation (MFN) basis. Prior to 2001, China's MFN status in the U.S. was subject to annual reauthorization by Congress. Although Congress never failed to reauthorize China's MFN status, the annual ritual possibly created risk in the minds of investors regarding the stability of China's economic relations with the United States. Pierce and Schott (2016) and Handley and Limao (2017) argue that the lurking prospect of a return to non-MFN tariffs, which averaged 37.0% in 1999 and compared to average MFN tariffs of only 3.4% in that year, dissuaded Chinese firms from investing in operations dedicated expressly to exporting to the United States.

WTO accession removed this uncertainty, potentially encouraging increased trade between China and the United States trade through this channel.

Finally, China's entry into the WTO allowed the country to benefit from reduced quotas on its exports of apparel and textile products, which WTO members had long retained alongside tariff reductions in other manufacturing industries under the Multi-Fiber Arrangement (Khandelwal, Schott, and Wei, 2013). The MFA quotas, after a staged phase out beginning in 1995, were fully eliminated in 2005. China would have begun to enjoy the impacts of relaxed MFA quotas in 2001, by which point two MFA quota reductions had occurred, in 1995 and 1998, and a third, in 2002, was about to occur. As MFA quotas in China prior to 2001 appeared to be allocated disproportionately to state-owned enterprises, their termination may have especially benefited foreign and domestic private enterprises in apparel and textile sectors.

Motivated by this context, we utilize four measures of the determinants of regional export growth in China: (i) the reduction in tariffs on output and on imported intermediate inputs, (ii) the reduction in uncertainty regarding China's access to the U.S. market, (iii) the elimination of MFA quotas, and (iv) underlying comparative advantage. Given the importance of multinational enterprises for China's exports, in a second stage of our analysis we evaluate export growth by firm ownership, in which we separate foreign-owned firms from domestically owned private firms and state-owned enterprises. The ownership distinction allows us to examine the differential performance of state-owned firms in reaching foreign markets, after the loss of their privileged control over foreign trading rights, MFA quotas, explicit government subsidies, and other benefits.

3 Patterns of Export Production in China

In this section, we summarize the data we use in our analysis and describe patterns of export production in China by regime, firm ownership type, sector, and region.

3.1 Data Sources

Trade data are from China's Customs Bureau, which gives details on export activity by HS 8-digit product (of which there are roughly 7,000), customs-district (which are roughly at the prefectural level and of which there are 742 in 2010), trade regime (discussed below and of which there are 15 in 2010), and ownership type of firm (discussed below and of which there are 7 in 2010). The separation of exports by trade regime and ownership type, as well as by detailed product code and regional identifier, provides an enormous amount of detail on trade in China. We elect to use these data, rather than commonly used firm-level data on trade in China, as the matching of firms to the customs data results in a substantial loss in total trade activity. We have data for the years 1997, 2000, and 2010 and we focus the analysis on the key 2000 to 2010 period. The year 1997 is the first for which prefectural level trade data are available, and, as mentioned, 2000 to 2010 spans the most intense phase of China's post-trade liberalization export growth.

To analyze regional export growth, we need to define geographic markets in China. Administrative units in the county are defined at four levels: provinces, prefectures, counties, and townships. We select the prefecture to be the target of our analysis, which leads us to aggregate more than 700 customs districts into 337 quasi-prefectural-level entities, which are roughly the equivalent of large metropolitan zones. We refer to these entities as cities. There are three justifications for this choice. First, people in China usually live and work within the same prefecture. (An exception to this regularity is the four large municipalities—Beijing, Chongqing, Shanghai, and Tianjin—which are provinces in themselves but are generally regarded as unified local labor markets.) The prefecture thus approximates a local labor market, which would be of interest in many applications of our results. Combining customs districts within a prefecture into a single entity implicitly allows shocks to one zone of a city (e.g., special economic zones in Xiamen) to affect exports in other zones of a city (e.g., locations outside SEZs in Xiamen). Second, many government policies — e.g., those related to migration restrictions, social policy, land-use policy or infrastructure investments — are implemented at the provincial or prefecture level. Third, most data released by China's National Bureau of Statistics data are at the provincial or prefecture level, whereas county, township or customs area level data are limited in availability. Analysis of local labor markets in the country would thus likely occur at the prefectural level.

3.2 Export Regimes and Ownership Types

We next describe export patterns by trading regime and firm ownership type. By far and away the two dominant regimes are ordinary exports—which are exports by firms that enjoy no special benefits regarding imported inputs—and processing exports—which encompass exports under in-bond arrangements in which firms post a bond equal to the value of duties on imported inputs and have the bond returned once they export their output, giving them tariff-free access to foreign intermediate goods under the constraint that all output is shipped abroad.

It is common for a country in the early stages of export-led growth to have processing exports dominate its shipments to foreign markets. This was the case in Hong Kong, Singapore, and Taiwan (Naughton, 1996), where firms entered export-oriented production by serving as assembly shops for foreign contractors. China has followed a similar pattern. Under export processing, a foreign firm typically provides the specifications for a product, orders or selects the inputs to be used in production, and handles distribution, while the firm in China simply provides the labor and other factors used to assemble or otherwise process the inputs into a final good (Feenstra and Hanson, 2005). Often, but not always, the foreign contractor owns the Chinese export-processing plant outright. In China's case, Hong Kong and Taiwan are the two primary economies involved in establishing and (or) contracting with export processing plants.

Table 1 shows that processing exports as a share of total exports stood at 55% in both 1997 and 2000, and then declined over the 2000s, dropping to 47% by 2010. Brandt and Morrow (2017) argue that the reduction in barriers on imported inputs induced many firms to reorient themselves from being export processors to becoming ordinary exporters, so as to relax the constraint of having to export the entirety of their output. The WTO accession thus may have encouraged China's move toward more vertically integrated production within manufacturing and in production by plants that ship to foreign markets in particular.

Given the importance of multinational enterprises in export processing, it is no surprise that foreign-owned enterprises (FOEs) account for the majority of exports under this regime. Table 2 shows that in 1997, foreign-owned firms represented 64% (0.350/(0.350+0.196) of China's processing exports, compared to their accounting for just 13% (0.061/(0.061+0.392)) of the country's ordinary exports. The foreign-firm share of processing exports rises over time, to 71% in 2000 and to 84% in 2010. The foreign-firm share of ordinary exports also rises over time, reaching 29% by 2010.

In the 1990s, the foreign-owned firms that obtained permission to operate in China were freed from having to export their output through state-owned intermediaries. Privately owned domestic enterprises (POEs) could not avoid this requirement. Table 2 shows that in 1997 all processing and ordinary exports by non-foreign firms were by state-owned enterprises (SOEs), which reflects the mandate still in effect at this time. As the government relaxed and then eliminated the control of foreign trading rights by state-owned firms, private domestic firms began to play a larger role in exports. The domestic private enterprise (POE) share of ordinary exports reached 46% in 2010 (from 0% in 1997) and of processing exports reached 6% in 2010 (also from 0% in 1997). By 2010, foreign-owned enterprises accounted for 55% of China's overall exports, followed by private domestic firms at 27% of overall exports and state-owned firms at 18% of the total. The relative decline of the state-owned sector in exporting is even more rapid than its decline in industrial production, which falls from one half in 1998 to just over one quarter in 2010 (Hsieh and Song, 2015).

3.3 Measuring Export Growth and Shocks to Export Growth

In specifying regional export growth, we need to account for the fact that some prefectures begin the sample period with relatively low levels of exports. These low export levels reflect the weak direct integration of many Chinese regions into the global economy, prior to China's accession to the World Trade Organization in 2001. Simply using the change in log exports to measure the expansion of exports would possibly create a distorted sense of growth in these locations. The obvious solution is to scale export growth by the size of the local economy. Because exports are a gross sales value, the value of gross output by prefecture would be a suitable scaling variable. In China, however, local- and industry-level output data are likely to be of low quality over our sample period. Because city boundaries changed dramatically in the 2000s, we would need to aggregate county-level data to construct city-level data. County-level data are likely subject to particularly severe measurement error, and have a large number of missing values which are unlikely to be random. Absent reliable local output data, we instead scale export growth by prefectural population at the beginning of the sample period. China's population census provides complete county-level data for the population based on the place of residence (rather than based on the location of one's official registration, or hukou status) in 1990, 2000 and 2010. Our resulting measure of regional export growth Δx_{it} is:

$$\Delta x_{it} = \left(\frac{X_{it} - X_{it-1}}{X_{it-1}} \right) \frac{X_{it-1}}{P_{it-1}} = \frac{X_{it} - X_{it-1}}{P_{it-1}}, \tag{1}$$

where X_{it} is exports by city i in final year t (2010 in our analysis) and P_{it-1} is the residence-based population in city i in the initial period, $t-1$ (2000 in our analysis). Table 3 presents summary statistics. The average growth in exports per capita across Chinese regions is 1.036 (measured in units of 1,000 US dollars, and thus corresponding to $1,036 per person), with an interquartile range of 0.034 to 0.463, implying substantial skewness in this measure. We address skewness by presenting results with and without four outlier cities that have exceptionally high levels of exposure to export growth, Dongguan, Shenzen, Suzhou, and Zhuhai. The first two are cities in Guangdong Province, which lie immediately to the north of Hong Kong; the third is a city that borders Shanghai; and the fourth is a city that borders Macao. Hence, the outliers in terms of export growth are cities that have access to major international ports and that were among the earliest locations in which special economic zones were established (Yu and Tian, 2012).

Bartik Predicted Export Growth

Our first shock to export growth is a Bartik (1991) type measure, a variant of shift-share growth decomposition which is commonly applied in labor economics (e.g., Diamond, 2016) to capture how national-level shocks are transmitted to local economies. We project national export growth onto Chinese regions by multiplying industry export growth in outside regions (i.e., excluding a given city i) by the initial share of an industry in city i's exports and then summing across industries in the city. The resulting Bartik measure is:

$$\Delta b_{it} = \left[\sum_j \frac{X_{ijt-1}}{X_{it-1}} \left(\frac{X_{jt}^{-i} - X_{jt-1}^{-i}}{X_{jt-1}^{-i}} \right) \right] \frac{X_{i0}}{P_{i0}}, \tag{2}$$

where X_{ijt-1}/X_{it-1} is the share of industry j in city i's exports in the initial period, which captures regional comparative advantage in the industry, and X_{jt}^{-i} is national exports in industry j and year t excluding the province in which city i is located.

The logic behind the expression in equation (2) as a determinant of export growth is that the initial pattern of export specialization in a city exposes the city to national-level shocks more in some industries than in others. There is a clear theoretical logic behind using initial city industry export shares to characterize the exposure of a city to national export growth opportunities. Taking a trade model with a gravity structure, one can easily show that regional or national exposure to global industry shocks (due, e.g., to trade reform or technological change at home or abroad) is summarized by the initial pattern of regional or national specialization by industry (Autor, Dorn, and Hanson, 2013 and 2016). Indeed, in the exact hat algebra of Dekle, Eaton, and Kortum (2008) for general-equilibrium trade models, these initial industry shares of activity in an economy fully summarize initial patterns of comparative advantage. As mentioned in section 1, our approach to measuring regional exposure to export growth opportunities does not require us to take a stand as to whether specialization patterns reflect comparative advantage, agglomeration economies, or their interaction. All that is required is that initial patterns of regional specialization are useful for predicting regional export growth, which we show empirically to be the case.

To avoid introducing a common source of measurement error on both sides of the regression equation, we measure the scaling variable in (2), X_{i0}/P_{i0}, using values from a pre-sample year (1997 in our analysis, which is the first year for which we have regional trade data). We define the population level for the pre-sample period in a region as the geometric mean of population levels in 1990 and 2000, given that population measures are only available in census years (e.g., 1990, 2000, 2010). In (2), we define industries at the HS 2-digit product level, in order to limit the distorting effects of zero values on measuring initial regional comparative advantage. Whereas in 2000 zero values populate 89% of city-HS-6-digit-product combinations and 81% of city-HS-4-digit-product combinations, zero export values account for just 54% of the city-HS-2-digit-product combinations.

To give an initial view of the data, Figures 1a and 1b plot the Bartik variable in equation (2) against export growth per capita in equation (1). In Figure 1a, we see both a strong positive correlation between the two variables (correlation coefficient of 0.61) and the presence of the four outlier cities in terms of export growth; in Figure 1b, we see that the correlation between Bartik-predicted and observed export growth remains strongly positive (correlation coefficient of 0.86) when the four outlier cities are dropped from the sample. We will report regression results with and without controls for the four outlier cities in the analysis.

Industry Tariffs

We include in the analysis measures of regional exposure to changes in output tariffs and to changes in input tariffs. To utilize the tariff data, we need to account for the fact that tariff measures for a given year are defined in terms of the HS product codes which apply to that year. The tariff data for 2000 are based on the 1996 HS codes, whereas the tariff data for 2010 are based on 2007 HS codes. To create a common basis for measurement, we first take the simple average of tariffs across HS 8-digit products within an HS 6-digit product in each year and then use the WITS crosswalk to convert the 2000 tariffs to the 1996 HS codes. Using as weights the share of each HS 6-digit product within China's HS 2-digit exports in 2000, we calculate the average HS 2-digit tariffs in 2000 and 2010, respectively. With these tariffs in hand, we then calculate the average change in output tariffs that apply to city i as:

$$\Delta\tau_{it}^{O} = \sum_{j} \frac{X_{ijt-1}}{X_{it-1}} \left[\ln\left(1+\tau_{jt}\right) - \ln\left(1+\tau_{jt-1}\right)\right], \tag{3}$$

where X_{ijt-1}/X_{it-1} is the share of HS 2-digit product j in city i's exports in the initial period and τ_{jt} is the tariff that applies to HS 2-digit product j in year t.

To calculate changes in tariffs that apply to intermediate inputs, we use the 2002 input/output table for China, which is defined for IO 5-digit sectors (of which there are 122) at the national level.[1] The construction of the input tariff proceeds in three steps. First, we convert HS 6-digit-product

[1] At the provincial level, I/O tables are calculated at the IO 2-digit level (42 industries). Because these data use more aggregate industry categories (and may be subject to measurement error in smaller provinces), we elect to use national I/O tables.

tariffs to 5-digit IO sectors. Second, we calculate the change in input tariffs for IO sector j in city i as:

$$\Delta\tau^I_{ijt} = \sum_{j'} \gamma_{jj'} \left[\ln\left(1 + \tau_{ij't}\right) - \ln\left(1 + \tau_{ij't-1}\right)\right], \tag{4}$$

where $\gamma_{jj'}$ is the share of inputs from IO sector j' in total input purchases by IO sector j. Third, we calculate the average change in input tariffs for city i by combining industry changes in input tariffs $\Delta\tau^I_{ijt}$ with initial city importing patterns. The resulting value is,

$$\Delta\tau^I_{it} = \sum_{j'} \frac{M_{ijt-1}}{M_{it-1}} \Delta\tau^I_{ijt}, \tag{5}$$

where M_{ijt-1}/M_{it-1} is the share of IO industry j in total imports by city i in the initial period. Because we cannot separate a city's imports in an industry into those used for intermediate inputs versus those used in final consumption, we impose the assumption that input and consumption shares for imports are the same within each industry and within each city.

In Figures 2a and 2b, we plot regional exposure to changes in output and input tariffs in equations (3) and (5) against regional weighted average initial tariffs. The strong, linear, and negative relationships between initial tariffs and tariff changes indicate that the magnitude of tariff reductions were driven largely by the level of China's pre-WTO tariff protection. As part of China's WTO accession, the country reduced both the mean and variance of tariffs, such that initially more-protected industries saw larger increases in foreign competition and in access to foreign inputs. After 2001, the regions in which these industries were concentrated thus also saw larger increases in import competition and imported-input access. This pattern of tariff change derives largely from the fact that the WTO mandates maximum levels for tariffs at the industry level. Initially high-tariff industries were thus mechanically subject to larger reductions in tariffs, as China brought its trade barriers in line with WTO guidelines.

In Figures 3a and 3b, we plot regional export growth against regional exposure to changes in input tariffs, first including all observations (in Figure 3a) and then dropping the four outliers cities. There is an apparent negative correlation between regional export growth and exposure to input tariff changes, indicating that cities enjoying fast increases in exports per capita were those specialized in industries that saw larger reductions in tariffs on imported inputs. The slope of the regression line falls sharply in absolute value when outlier cities for export growth are dropped.

NTR Gap (Pierce and Schott tariff uncertainty measure)

Pierce and Schott (2016) measure uncertainty in trade policy confronting China before its accession to the WTO using the difference in U.S. non-MFN and MFN tariffs—which they refer to as the normal trade relations (NTR) tariff gap. This gap represents the increase in tariffs that would have occurred had U.S. Congress not reauthorized China's MFN status in the U.S. market. While China was granted MFN status in the United States in 1980, Congress instituted a requirement for annual reauthorization after the events at Tiananmen Square in 1989. Once China became a WTO member in 2001, it was no longer subject to this annual reauthorization risk. U.S. non-MFN tariffs have changed only modestly since the 1930s. We take the simple average of HS 8-digit NTR and non-NTR tariffs within HS 6-digit products for the year 1999. We then calculate the average NTR gap among the HS-6-digit products that are contained in a HS 2-digit code, using as weights the share of an HS 6-digit product in China's HS 2-digit exports to the United States. Finally, we calculate the regional NTR gap by combining NTR gaps at the HS 2-digit level with the initial composition of a region's exports across HS 2-digit products, yielding the following measure:

$$NTR_i = \sum_j \frac{X_{ijt-1}}{X_{it-1}} \left[\sum_{k \in j} \gamma_{jkt-1} \left(\tau_{k,1999}^{non-NTR} - \tau_{k,1999}^{NTR} \right) \right], \tag{6}$$

where X_{ijt-1}/X_{it-1} is the share of HS 2-digit product j in city i's exports in the initial period, γ_{jk} is the share of HS 6-digit product k in China's exports of HS 2-digit product j to the United States in the initial period, and $\tau_{k,1999}^{non-NTR}$ ($\tau_{k,1999}^{NTR}$) is the U.S. non-NTR (NTR) tariff for HS 6-digit product k in 1999. The average NTR gap has a mean value of 32% (standard deviation of 13%) across Chinese regions (see Table 3).

MFA Quotas

To capture the exposure of regions to the removal of MFA quotas, we calculate the export share of products subject to MFA quotas within each HS 2-digit product in the year 2000, where we account for the fact that some HS 8-digit products may be subject to a quota in one market (e.g., the United States) but not in other markets (e.g., Canada). The resulting measure of exposure to the elimination of MFA quotas for city i is, in 2000:

$$MFA_i = \sum_j \frac{X_{ijt-1}}{X_{it-1}} MFA_{j2000}, \tag{7}$$

where MFA_{j2000} is the share of exports in HS 2-digit product j subject to MFA quotas in the year 2000. The average value for this share is 2%, with a maximum value of 12% (Table 3).

4 Empirical Results

The specification for regional export growth that we estimate is the following:

$$\Delta x_{it} = \alpha_s + \beta_1 \Delta b_{it} + \beta_2 \Delta \tau_{it}^O + \beta_3 \Delta \tau_{it}^I + \beta_4 NTR_i + \beta_5 MFA_i + \epsilon_{it}, \tag{8}$$

where Δx_{it} is growth in exports per capita for city i from (1), α_s is a dummy variable for the province in which city i is located, Δb_{it} is the Bartik predictor of regional export growth in (2), $\Delta \tau_{it}^O$ is the exposure of city i to changes in output tariffs in (3), $\Delta \tau_{it}^I$ is the exposure of city i to changes in input tariffs in (5), NTR_i is the average NTR gap confronting city i as of 1999 in (6), MFA_i is the average share of exports by city i subject to MFA quotas as of 2000 in (7), and ϵ_{it} is an error term. $\Delta\tau_{it}^{O}$ ($\Delta\tau_{it}^{I}$) is replaced as zero for cities with no export (import) in 2000. Accordingly, a dummy variable for the 18 cities with no import or export in 2000 is included. The time period for the analysis is 2000 to 2010, meaning that we estimate a single long difference for 337 cities, which are approximately at the prefectural level. The province-managing counties (accounting for 1% of China's population in 2000) which the provincial government could by-pass the prefecture government to control directly are merged into prefectures which used to govern the counties. Standard errors are clustered at the province level (of which there are 31 and which include 5 autonomous regions and 4 municipalities).

4.1 Results for the Bartik Predictor and Industry Tariffs

Table 4 presents our main estimation results. Panel (A) shows baseline regressions that do not include any covariates other than an indicator variable for the small number of cities that lack foreign trade in the base year. The column (1) estimate indicates that the shift-share instrument is a strong and precise predictor of local export growth (t-statistic of 7.3). The large R-squared value of 0.63 indicates that patterns of local export growth largely reflect national industry trends in exporting, rather than city-specific shocks.

In column (2), we replace the shift-share variable with regional exposure to the change in output tariffs. The negative coefficient indicates that regions whose industries have been subject to larger reductions in output tariffs had more rapid export growth, a finding that we will see is not robust. A negative coefficient also appears on regional exposure to changes in input tariffs, in column (3). When we include both input and output tariff exposure together in the regression, in column (4), a similar result obtains. Exposure to output-tariff changes enters negatively, indicating that cities exposed to larger increases in foreign competition have greater export growth. Exposure to input-tariff changes also enters negatively, indicating that cities enjoying greater improvements in access to imported inputs experience faster export growth. The coefficients are precisely estimated and quantitatively sizable.

The finding on input tariffs is consistent with substantial evidence that reductions in barriers to foreign inputs raise industry productivity and output (e.g., Yu, 2015; Brandt, Van Biesebroeck, Wang, and Zhang, 2017). Comparing cities at the 25th and 75th percentiles of exposure to output-tariff reductions, the latter has greater export growth by 483 US dollars per person ($(.08-.05)\times 16.1$ units of 1,000 dollars per capita), or 0.2 standard deviations; comparing cities at the 25th and 75th percentiles of exposure to input-tariff reductions, the latter has export growth that is greater by 904 dollars per person ($(.04-.02)\times 45.2\times 1000$), or 0.3 standard deviations. These impacts fall substantially, however, when further controls are added to the regression.

In columns (5) to (7) of Table 4 (panel A), we add the Bartik predictor of city export growth to the specifications with tariff variables. The result is a substantial increase in the explanatory power of the regression, with the adjusted R-squared rising from 0.10 in column (4) — with just output and input tariffs as regressors — to 0.64 in column (7) — with the Bartik measure added to the specification. Using the column (7) results, moving a city from the 25th to the 75th percentile of exposure to national-industry export growth leads to higher export growth of 238 dollars per person $((.43-.02)\times 0.58\times 1000)$, or 0.08 standard deviations. Further, the inclusion of the Bartik predictor leads to a substantial reduction in the estimated impacts of output-tariff or input-tariff changes on regional export growth. Adding the Bartik variable causes the coefficients on both tariff variables to fall by nearly three fifths (when comparing column 7 to column 4), though both variables remain at least marginally statistically significant.

Panel (B) of Table 4 repeats the regressions in panel (A), now with province dummies added to the specification. Comparing column (1) in panels (A) and (B), we find no impact of these geographic controls on the coefficient estimate for predicted export growth, while the precision of the estimate improves. Columns (2)-(4) in panels (A) and (B) however show that the inclusion of province dummies leads the absolute magnitude of the coefficients on output-tariff changes to fall by about three-quarters and input-tariff changes to fall by half. The sensitivity of exposure to tariff changes to the inclusion of provincial dummies suggests that these measures could be correlated with unobserved regional shocks — e.g., regarding the establishment of SEZs, openness to internal migration, or the phaseout of state-owned enterprises. When we further add the Bartik predictor of regional export growth, the tariff coefficients fall further. In column (7), the panel (B) coefficient on output tariffs is only two-fifths as large and the coefficient on input tariffs is only one-quarter as large, when compared to the coefficients in panel (A); with province dummies included, the first variable is insignificant while the second is marginally significant. By contrast, the coefficient on the Bartik predictor remains strongly positive and precisely estimated, increasing slightly in absolute value when provincial controls are added to the regression. The stability of the coefficient on Bartik-predicted exports to the inclusion of provincial dummy variables indicates that this variable captures robust explanatory factors behind regional export growth, including the exposure of regions to comparative-advantage or industry-agglomeration driven export expansions associated with China's phase of post-reform transitional growth.

In panel (C) of Table 4 we further add dummies for the four outlier cities seen in Figure 1a. The absolute coefficient magnitudes on output tariffs and input tariffs decline further, while for the Bartik variable they increase modestly. Considering the results in column (7), output and input tariff coefficients fail to achieve statistical significance. Comparing cities at the 25th versus 75th percentiles of exposure to output-tariff reductions, the latter would have export growth that is 0.01 standard deviations higher, while comparing cities at the 25th versus 75th percentiles of exposure to input-tarriff reductions, the latter would also have export growth that is 0.02 standard deviations higher. The Bartik variable continues to be strongly positive and precisely estimated. Comparing cities at the 25th versus 75th percentiles of exposure to national-industry export growth, the latter would have export growth that is 0.10 standard deviations higher.

The shift-share variable and the tariff variables are all functions of a city's export composition across industries in the base year 2000. It is therefore possible that any of these variables could be correlated with unobserved sectoral shock such as different technology trends. Panel (D) of Table 4 augments the baseline model of panel (A) with two control variables for the share of textile and apparel, and the share of electronics and machinery in a city's exports in 2000. In 1997, both of these sectors accounted for over a quarter of all Chinese exports (29% textile and apparel, 27% electronics and machinery). By 2010, the fraction of textile and apparel had declined to 15%, while exports of electronics and machinery had expanded to 50% of all exports. The results in column (1) of panel (D) indicate that the inclusion of these controls modestly reduces the coefficient estimate for predicted export growth compared to the baseline model in panel (A) while precision improves. All coefficient estimates for the tariff variables in the subsequent columns of panel (D) are much smaller than the initial estimates in panel (A), and none reaches a high level of signficance.

The final panel (E) of Table (4) includes both the geographic controls from panel (C) and the two controls for sectorial composition from panel (D). The estimate for the Bartik variable retains a similar magnitude as in the previous specifications, and it remains highly significant. By contrast, estimates for the tariff variables are modest in magnitude and never significantly different from zero, irrespective of the exclusion or inclusion of the Bartik variable in the regression model (columns 2-4 vs columns 5-7).

There are three primary lessons from these results. First is that for explaining regional export growth in China, the variation in regional exposure to output- and input-tariff changes that is independent from regional exposure to national-industry export growth is modest. The Bartik predictor functionally operates as an omnibus measure of the sources of export growth in China, implicitly capturing a substantial portion of the trade-policy shocks associated with explicit output- and input-tariff changes. Second, and related, is that because the magnitude of tariff reductions in China was largely determined by the level of initial tariffs (Figures 2a, 2b) it appears to be the strong comparative-advantage industries — i.e., industries that following the phaseout of Maoist-era distortions were most primed for export growth — that were initially the most protected. Thus, when we add the Bartik predictor to the regression, the impact of output- and input-tariff changes is diminished, while the explanatory power of the regressions improves sharply. The increase in explanatory power suggests that there are non-tariff policy distortions that kept China's comparative-advantage industries artificially small in the pre-reform period, such that their removal helped unleash a surge in growth in the regions in which these industries were concentrated. Evidently, regional exposure to the removal of these other distortions is far from fully encapsulated by regional exposure to industry tariff changes. Third, the Bartik predictor yields stable results across regression models that do or do not control for province dummies, outlier cities and initial sectorial composition. This pattern indicates that the shift-share variable is able to predict variation in export growth across cities within the same province, and across cities that had a similar pattern of specialization across broad industrial sectors. The variation in export growth that is related to the tariff variables instead gets largely absorbed by a parsimonious set of geography and sector controls, which implies that it is difficult to separate the impact of tariffs from other shocks that operate at the level of provinces or broad sectors.

4.2 Results on the NTR Gap and MFA Quotas

In Table 5, we expand the analysis to include the NTR gap, which is the Pierce and Schott (2016) measure of pre-WTO tariff uncertainty confronting China in the U.S. market. Accordingly, we use regional growth in exports to the United States instead of regional export growth to construct the dependent variable in equation (1) for Table 5. The Bartik predicted export growth is constructed in a similar way by using predicted export growth to the United States. The NTR gap enters positively and is precisely estimated in column (1) of panel (A), a specification with no other controls in the regression. This finding indicates that regions more specialized in industries subject to greater uncertainty over U.S. trade policy in the 1990s enjoyed faster export growth in the 2000s, once China had joined the WTO. However, the coefficient on the NTR gap falls substantially and loses significance in column (3), with the Bartik predictor and output and input tariffs added to the specification.

For completeness, we also examine results using an alternative measure of trade policy uncertainty. Columns (4) to (6) of panel (A) of Table 5 use the Handley and Limao (2017) measure of pre-WTO U.S. trade policy uncertainty for China. We see a similar pattern for coefficient estimates on this variable as for the NTR gap, with a large, positive and precisely estimated effect with no other controls in the regression (column 4), which falls to near zero when additional controls are included (column 6). With either measure of trade-policy uncertainty included in the regression, coefficient estimates on tariff variables have similar values and patterns of statistical significance as in Table 4.

We obtain considerably smaller coefficient estimates on the NTR gap and the Handley and Limao (2017) trade-policy uncertainty measure in panel (B) of Table 5, which reports specifications that incorporate dummy variables for provinces and four outlier cities. It is now the case that both trade-policy uncertainty measures are highly insignificant in all specifications, no matter whether or not the Bartik and tariff variables appear in the regression. In columns (3) and (6), the NTR gap and the Handley-Limao measure have t-statistics of 0.38 and 0.30, respectively. It thus appears that regional exposure to uncertainty over U.S. trade policy can only predict spatial variation in export growth to the United States across Chinese provinces, but not across cities within provinces.

The regression models in panel (C) of Table 5 omit the province and outlier city dummies, but control for initial export shares of the textile/apparel and electronics/machinery sectors. These controls for broad sectorial composition of export activity reduce the panel (A) estimates for NTR gap and trade policy uncertainty by more than half in most models, suggest that tariff uncertainly varies primarily across rather than within broad sectors. Taken together, the panel (B) and (C) results imply that it is difficult to separate effects of tariff uncertainty from province-level and sector-level shocks.

Table 6 expands the analysis to include regional exposure to the elimination of MFA quotas. We report results with and without provincial dummy variables, control for the four outlier cities (which accounted for a large fraction of China's apparel and tariff production in its pre-WTO era), and control for the initial export shares of the textile/apparel and electronics/machinery sectors. In no specification is the coefficient on MFA quotas precisely estimated. There is little change in the results when the Bartik predictor, tariff variables and the NTR gap are added to the specification (columns 4-6). We conclude that there is little evidence regional exposure to the elimination of MFA quotas affected regional export growth in China during the 2000s.

4.3 Results on Exports by Trade Regime and Firm Ownership Type

In Table 7, we expand the analysis by disaggregating exports by customs trade regime. Column (1) replicates results from column (7) and panel C of Table 4. Column (2) uses processing exports alone (rather than total exports) to construct the dependent variable in equation (1), while column (3) uses ordinary exports in the equivalent variable construction. Bartik predicted export growth is based on all trade. We see qualitatively similar results to those in Table 4. Overall Bartik-predicted export growth is strongly positive correlated with regime-specific export growth, both under the ordinary trade regime and the export-processing regime. Columns (4) and (5) repeat the analysis, now using regime-specific trade to construct Bartik-predicted export growth, with broadly similarly results. Finally, in column (6) we return to total export growth as the dependent variable and include regime-specific Bartik-predicted exports. With both Bartik variables in the regression, we see that predicted growth in processing exports is the stronger variable of the two, with a coefficient of 1.11 for Bartik-predicted processing exports compared to 0.33 for Bartik-predicted ordinary exports, where the former is very precisely estimated while the latter fails to achieve statistical significance.

Finally, we turn to exports by firm ownership type in Table 8. We perform an analysis similar to that in Table 7, in which we analyze export growth separately for state-owned enterprises (SOEs) in columns (1) and (4), private domestic enterprises (POEs) in columns (2) and (5), and foreign-owned enterprises (FOEs) in columns (3) and (6). In columns (1)-(3), we see that overall Bartik-predicted export growth is strongly positively correlated with export growth of each ownership type; in columns (4)-(6) we see that Bartik-predicted export growth for each ownership type is strongly positively correlated with export growth of that type (i.e., predicted SOE export growth has a strong positive impact on actual SOE export growth, etc.). In column (7), we combine the three Bartik-predicted export growth measures together to explain total city export growth. Strikingly, while Bartik-predicted export growth for foreign-owned enterprises has a positive and precisely estimated impact on overall export growth, predicted export growth for SOEs and POEs enter insignificantly, and the latter with a negative sign. Of the components of predicted city export growth that matter for overall export expansion, it is growth related to foreign-owned firms that appears to be the most important, both economically and statistically.

Why might the shift-share analysis show that the local presence of foreign-owned enterprises — and their associated national growth — is the strongest predictor of regional export booms among the three ownership types? One possibility is that foreign-owned firms may be a channel through which local firms learn about foreign market opportunities. That is, export production by foreign firms may generate positive spillovers to nearby firms by showing them the types of goods to produce (helping spread product innovations), how to manufacture them (helping spread process innovations), and where to sell them (helping spread marketing knowledge). Another possibility is that local governments successful in attracting foreign firms may offer a policy environment that is conducive to trade growth for all firm types. Such policies could include the more efficient operation of customs, relatively low regulatory burdens, and greater ease of resolving commercial disputes. A third possibility is that Deng's experiments in creating SEZs had long-lasting effects. Initially, foreign-owned firms were confined to operate in SEZs, which were concentrated in a few select locations in the country. Over time, SEZs proliferated and private firms, both foreign and domestic, were permitted to produce for export in many locations. The early establishment of SEZs may have shaped later local industrial development, and perhaps policy-makers attitudes toward foreign trade, in a manner that had persistent effects on regional export activity.

5 Discussion

Over the last quarter century, China has experienced one of the greatest manufacturing booms that the world has ever seen. The country's dramatic expansion in the supply of exports and in the demand for imported inputs have upended markets globally. The China export-supply shock has contributed to reductions in manufacturing employment in regions specialized in labor-intensive manufacturing in Germany, Mexico, Norway, Spain and the United States, among other countries (Autor, Dorn, and Hanson, 2016). In turn, the China import-demand shock contributed to spikes in global commodity prices in the mid to late 2000s, with concomitant sharp increases in export earnings in commodity exporting economies. Although the China shock appears to have peaked in the late 2000s, the two-decade-long period of growth in the country's manufacturing sector has enduringly transformed the global economy.

Driving China's export growth is the country's greater openness to foreign trade and investment. Although there is a long list of potential factors that are responsible for China's export surge, most literature to date has focused on one or another factor, without considering them in concert. Our goal in this paper is to evaluate the contributions of exposure to changes in output tariffs, input tariffs, uncertainty over trade policy, and MFA apparel and textile quotas to regional export growth in China. We compare the role of these specific measures of policy change to a Bartik predictor, which captures differential regional exposure to export growth tied to China's underlying comparative advantage. That is, while industry-specific changes in trade policy surely matter for explaining China's recent trade expansion, what has also driven manufacturing export growth is the country's once-in-an-epoch transition from near economic isolation to a high degree of openness. During this process of transitional growth, regions more specialized in strong comparative-advantage industries (or strong agglomeration-economy industries) would have experienced larger increases in production, as China reoriented from production for its domestic market to production for the global economy and moved from a distorted equilibrium far inside its technology frontier to an equilibrium more closely aligned with world relative prices for goods and services.

Our findings indicate that a simple Bartik measure is the strongest and most robust predictor of

China's regional export growth among those examined. It consistently explains a larger share of the spatial variation in export growth than any of the tariff-based variables, and remains a significant predictor of export growth also in regressions that allow for different time trends across provinces and broad sectors. With other controls in the regression, changes in output tariffs and input tariffs, trade-policy uncertainty and MFA quota elimination instead appear to be only weakly related to China's regional export growth. These results imply that regional variation in Chinese export growth, and particular spatial variation within provinces, has important determinants beyond tariff policy which are captured by the Bartik measure.

Looking forward, one would expect that the contribution of China's initial comparative advantage for its regional export growth may attenuate. As China's period of post-transition growth comes to an end, the country appears to be engaging in more concerted industrial policy, as indicated by intensifying government efforts to move the country into the production of high-end electronics, renewable energy technologies, and sophisticated transportation equipment. Similarly, the effects of changes in specific trade policies may also recede in importance for China's regional export growth. Reductions in import barriers were most intense in the half-decade immediately after China's WTO accession. These impacts will likely lessen in importance as the country moves further away from its entry date. If, indeed, industrial policy increasingly supplants the role of China's market transition in guiding the expansion of its export activity, other factors may rise in importance in explaining the regional distribution of export production. These factors may include the ability of regional government officials to steer industrial policies in favor of their local industries and firms.

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